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Device for locking and unlocking a vehicle door

5 The invention relates to a device for locking and unlocking a vehicle door according to the preamble of Patent Claim 1.

10 In vehicles by the applicant, an electronic driving authorization system with the name KEYLESS-GO, which operates without a mechanical key, is used. Its identification function is performed by a thin chip card with the format of a conventional EC or credit card. The advantage is that before car drivers get into
15 the vehicle they do not have to have the key or card in their hand but instead the card can always remain in their shirt pocket or jacket pocket. The door handles are equipped with contact-sensitive sensors and the lid of the trunk is equipped with a special momentary
20 contact switch. As soon as the driver touches a door handle or activates the momentary contact switch on the rear of the vehicle, his/her chip card receives signals from inductive antennas which are accommodated in the doors and in the rear bumper of the vehicle. In
25 response, the card transmits an identification code to the vehicle by radio. If said code corresponds to the stored value, the owner of the card can immediately get into the vehicle or open the lid of the trunk. The inductive data transfer lasts only for a few fractions
30 of a second.

In order to secure the vehicle after the driver gets out it is sufficient to press a key on the door handle or on the lid of the trunk in order to activate the
35 inductive antennas. The system immediately exchanges data with the chip card again and said data is stored for the later unlocking process, and then secures the car.

DE 196 17 038 C2 discloses a lock system and a driving authorization system in which at least one electrode is installed in each of the grip parts of the door handles and in which a counter-electrode, which may also be the door itself, is mounted on the part of the doors lying opposite the grip part. If an electrical field is built up between the two electrodes, said field can be advantageously used to sense even the desire to access the vehicle on the part of a person who is reaching for the door handle. This is done in that a hand which reaches for one of the grip parts located on the doors already brings about a change in the capacitance built up between the two electrodes as it approaches. An electronic system which perceives the change in the capacitance and converts it into a command pulse is contained in a space-saving fashion in the grip part of the door handle. The command pulse which is generated by this electronic system triggers the interrogation of the data carrier in the electronic control unit. The lock system can be locked by a second sensor or momentary contact switch which is mounted on the outside of the grip part. The vehicle is then secured by a person running their hand past in front of the side of the grip part facing away from the vehicle.

Furthermore, DE 197 45 149 A1 describes the transmitter/receiver unit for the command pulse to the electronic control unit also being arranged in the region of the door handle.

The invention is then based on the object of specifying a device for locking and unlocking a vehicle door with a door handle which is attached to the outer side thereof and which provides an advantage in terms of time in comparison with the devices known from the prior art, and has improved reliability.

The object is achieved by means of a device for locking

and unlocking a vehicle door having the features of patent claim 1.

According to the invention, the triggering processes of
5 the person-related identification code interrogation
and the unlocking of the door are separated in terms of
time and space. At first, the identification code
interrogation is brought about when the identification
10 sensor (for example a momentary contact switch or a
capacitive proximity sensor) which is easily accessible
from the outside responds and the unlocking is then
brought about by means of the unlocking sensor (for
example a momentary contact switch or a capacity
15 proximity sensor) which can be actuated by gripping
behind the door handle. Due to the separation of the
functions and the arrangement of the sensors, the
actual unlocking process takes place significantly more
quickly than in devices which are known from the prior
art. In order to ensure that the manual intervention
20 allows the identification sensor to be reached and
triggered more quickly, it should be located in an
easily accessible region of the door handle, for
example in its upper region or its region facing away
from the door. By separating the functions of the
25 identification code interrogation and the unlocking
process it is also possible for only the identification
code interrogation to take place at first and for the
unlocking to take place at a significantly later time,
which also allows the reliability of the system to be
30 improved.

In one refinement in which the unlocking sensor and the
identification sensor are embodied as capacitive
sensors, it is advantageous if the capacitive
35 identification sensor is less sensitive than the
capacitive unlocking sensor. Unintentional
identification code interrogations are thus avoided.
These unintentional triggering processes are caused,

for example, by weather-related influences such as water or snow on the door handle. Incorrect triggering of the identification sensor is not dangerous since the actual unlocking of the vehicle door only takes place
5 in the second step with the unlocking sensor which is not subject to the weather conditions to the same degree as the identification sensor.

It is advantageous if the identification code
10 interrogation can also be started with the unlocking sensor. As a result, the identification code interrogation can take place redundantly. As a result, the identification code interrogation can still be carried out even if there is a possible failure of the
15 identification sensor.

Further advantageous refinements of the invention are represented in the subclaims.

20 The invention is explained in more detail in relation to a plurality of exemplary embodiments in the single figure, with the figure showing a detail from a vehicle door with a door handle mounted on the outside thereof, in a schematic illustration.

25 The detail of a vehicle which is illustrated in the figure comprises a partially illustrated door 2 and a door handle 4 which is mounted on the outside thereof. The device for locking and unlocking the vehicle door
30 comprises three capacitive sensors 6, 8, 10 which are mounted in the interior of the door handle 4.

The capacitive identification sensor 6 is arranged in the upper internal region of the door handle 4. It
35 serves for starting an identification code interrogation by means of an access authorization system (not illustrated). In one exemplary embodiment (not illustrated in more detail), the door handle 4 is

covered by a chrome panel in the region of the capacitive identification sensor 6.

5 The capacitive unlocking sensor 8 is mounted in the door-side region of the door handle 4 and can therefore be activated only by gripping behind the door handle 4. It is used to unlock the door 2. In addition, a capacitive locking sensor 10 is arranged in the region of the door handle 4 facing away from the door, in
10 order to unlock the door 2. Said locking sensor 10 could also be embodied as a momentary contact switch.

During natural manual access, indicated by the arrow 12, by a person with access authorization in order to
15 open the door 2, said person firstly runs his hand over the upper region of the door handle 4 and arrives at the sensitive region of the capacitive identification sensor 6. The sensor 6 detects the hand and triggers an identification code interrogation in the access
20 authorization system in a known fashion, during which interrogation an inductive transfer of data takes place between the vehicle and a chip card which is carried along by the person with access authorization.

25 The hand actually arrives at the sensitive region of the capacitive unlocking sensor 8 during this identification code interrogation. When said unlocking sensor 8 is triggered, the positive identification code interrogation has already been completed. The vehicle
30 is then unlocked by the triggering of the unlocking sensor 8. Given a negative result of the identification code interrogation the unlocking process is suppressed. The functions of identification code interrogation and unlocking are thus distributed between the two
35 capacitive sensors 6, 8 and, in terms of timing, they occur in succession. Because the identification sensor 6 becomes sensitive at an early time, the entire process from the identification code interrogation to

the actual unlocking occurs significantly more quickly than the systems which are known from the prior art and in which the identification interrogation and unlocking are triggered by a single sensor.

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The identification sensor 6 can also be arranged on the side of the door handle facing away from the door in order, for example, to be triggered by the ball of the thumb or the thumb of the hand grasping the door
10 handle.

Since the sensors 6, 8, 10 are capacitive sensors in the interior of the door handle 4, every type of expenditure involved in having to protect switches
15 which are located on the door handle against the ingress of dust, dirt and water is dispensed with. The capacitive sensors 6, 8, 10 are cast after installation. The door handle on the outside is thus visually indistinguishable from a door handle without
20 further additional functions.

In conjunction with KEYLESS-GO, an improvement in the locking and unlocking procedure of the individual vehicle doors and of the lid of the trunk is obtained.
25 Operator control is no longer carried out by means of visible switches. The vehicle is unlocked solely by grasping on the door handle 4 when the vehicle is locked. In order to secure the vehicle, that is to say to lock it, the surface of the door handle 4 facing
30 away from the door is merely touched in the sensitive region of the capacitive locking sensor 10 or a hand is run past over it. The vehicle is consequently locked. The operator-friendliness is thus also increased.

35 In a further exemplary embodiment (not illustrated in more detail), the locking sensor 10 and the identification sensor 6 are functionally combined in a single combination sensor. This is possible because the

locking function is never required simultaneously or in direct chronological proximity to the identification function. As a result, the combination sensor can carry out the identification function when the vehicle is
5 locked, and the locking function when the vehicle is opened. The combination sensor may be embodied as a momentary contact switch or as a capacitive sensor.